UNITED STATES MARINE CORPS
Basic Officer Course
The Basic School
Marine Corps Combat Development Command
Quantico, Virginia 22134-5019

B1455

LOCATION

Student Handout

1. **Locating Positions**. There are three methods of locating positions.

a. Inspection. Inspection is a method of determining your location by matching the surrounding terrain features to the corresponding features on the map.

(1) Locate two or more features on the ground whose symbols you can find on the map sheet.

(2) Orient the map so that the features on the map are aligned with their natural counterparts.

(3) Estimate your actual position in relation to the features already identified.

(4) This method of determining your position is fast, but may be inaccurate.

b. Intersection. Intersection is the location of an unknown point by sighting on the unknown point from one or more known positions.

(1) Two point intersection

(a) Orient the map sheet.

(b) Identify your known position and mark it on the map.

(c) Determine the magnetic azimuth from your known position to the unknown position.

(d) Convert the magnetic azimuth to a grid azimuth.

(e) Plot the grid azimuth from your known position to the unknown point.

(f) Repeat this procedure from another known point.

(g) With a protractor, read the 8-digit grid coordinate at the intersection of your plotted lines. This indicates the location of the unknown point.

(2) One point intersection. If the unknown point is located on a linear feature (i.e., road, draw, telephone line, finger, etc.), you can determine its position in the following manner:

(a) Repeat steps (a) through (e) above.

(b) The location of the unknown point is the intersection of the plotted line with the linear feature.

c. Resection. Resection is a method of determining your location by sighting on one or more known features.

(1) Two point resection

(a) Orient the map sheet.

(b) Identify a known feature on the ground and on the map.

(c) Determine the magnetic azimuth to the known feature.

(d) Convert the magnetic azimuth to a grid azimuth.

(e) Determine the grid back azimuth.

(f) Plot the grid back azimuth from the known feature on your map.

(g) Repeat this procedure for another known point.

(h) With a protractor, read the 8-digit coordinate at the intersection of your plotted lines. This indicates the location of your position.

(2) One point resection. If you are located on a linear feature, you can determine your position in the following manner:

(a) Repeat steps (a) through (f) above.

(b) Your location is the point at which your plotted line crosses the linear feature.

2. **Terrain Profiling**. A good knowledge of the local terrain is essential to most military operations. For many purposes, a study of the contour lines on a map, or a walk-over of the terrain, is sufficient. When more precision is needed, a profile of the terrain may be required. Terrain profiling provides us with a quick, easy to understand method of visualizing the lay of the land.

a. A terrain profile is defined as an exaggerated side view of a portion of the earth's surface along a line between two points. This can be easily visualized. Imagine yourself on a plain with one hill in the center and you are looking straight at the hill. If the hill could be cut in half from the top to the bottom perpendicular (90°) to your line of sight, you would be facing a cross section of the hill with its outline visible to you. An accurately scaled drawing of this outline would be a profile of the hill.

b. The military applications of such a profile include:

(1) Determining the most effective fields of fire for direct fire weapons

(2) Determining dead space to be covered by indirect fire weapons

(3) Determining visibility and hidden areas from observation posts

(4) Various applications for engineers, communicators, and aircrews

c. A terrain profile can be constructed from any contour map. The first step is to construct a profile chart.

(1) On a blank sheet of paper, draw a series of equally spaced horizontal lines. Each of these lines will represent a different elevation. Make sure you have enough lines to cover all the variations of elevation along the line you wish to profile.

(2) Label these lines by elevation, the top line as the highest elevation and the bottom line as the lowest elevation. Add an extra line on each end of the scale. The raw profile chart is now complete and ready for use.

d. The next step is to transfer the information on the map to the profile chart.

(1) Take your map and draw a line along the terrain you wish to profile. Label the ends of this line A and B and note the 8-digit coordinates of points A and B. Now, you will draw an accurately scaled side view of the terrain along line AB.

(2) Place your profile chart on your map, with the uppermost line adjacent to and parallel with the line AB. Secure the profile chart to the map with paper clips, tacks, or an expedient.

(3) From every point on line AB where a contour line crosses or touches, drop a perpendicular line to the line on the profile chart which has the same value as the contour line. Interpolate the elevation value of hilltops and draws. Put a tick mark on the profile chart where the perpendicular line crosses.

(4) Connect the tick marks with a smooth, natural curve.

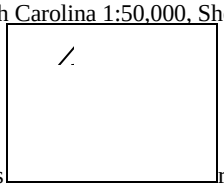
(5) If possible, augment this with a walk along line AB on the ground. Minor elevation differences such as holes and depressions should be accurately measured and drawn in by hand.

(6) Finally, add marginal information to the profile chart. Put the map sheet designator and a scale on the profile chart, and, most importantly, put the 8-digit grid coordinates of points A and B on the chart. This allows all personnel with the same map sheet to use the profile.

APPENDIX A

REQUIREMENT 1

Map: New River, North Carolina 1:50,000, Sheet 5553 III, Series V742, Edition 8-DMA

NOTE: For these problems  represents a tower.

Section 1

1. You have made a practice landing on Onslow Beach. Battalion requests the 8-digit grid coordinate of your position. From your position, you shoot a magnetic azimuth to the bridge in GS 9127 and convert it to a grid azimuth of 50°. Repeating this process with the tower in GS 8725 you determine the grid azimuth to the tower to be 255°. What is the 8-digit grid coordinate of your position to the nearest 50m?

ANS.

2. Moving inland and establishing a position on hill 16 in GS 8627, you observe an aggressor tank column moving along the hard surface road, Route 172. After shooting a magnetic azimuth to the tank column, you determine the corresponding grid azimuth to be 62°. What is the location of the tank column to the nearest 50m?

ANS.

3. Upon landing on Onslow Beach and reaching the first improved light-duty road, you discover that your amphibious assault vehicle driver is confused as to his position. The battalion tactical net has reported a burning enemy tank on a bridge in GS 9127. From your position, you can see a column of smoke on a magnetic azimuth of 46° 30'. What is your location to the nearest 50m?

ANS.

4. Your recon patrol is at a major road intersection in GS 7835 and from your position you can see an enemy convoy has halted and troops are deploying from trucks on a magnetic azimuth of 296 degrees. What is the location of the convoy to the nearest 50m?

ANS.

Section 2

1. Your convoy is on a road at grid 88922810 and is taking heavy fire from an enemy gun boat in the intercoastal waterway. You spot the boat on a magnetic azimuth of l97°. At what 8-digit coordinate should you call in your fire mission?

ANS.

2. A reconnaissance team established at Yopps Church in GS 7926 reports sighting tracked vehicles which are moving inland along Everett Creek. The team sights them on a magnetic azimuth of 287°. Another team set up in the building at the road intersection in GS 7626 sees tracked vehicles on a magnetic azimuth of 61° 30'. What is the location of the tracked vehicles to the nearest 50m?

ANS.

3. You are ordered to send a second patrol out to secure an LZ for reinforcements at the clearing in GS 7724. The squad leader becomes confused as to his location enroute. He can see the steeple of Little Zion Church in GS 8026 on a magnetic azimuth of 65° and the bridge in GS 7722 on a magnetic azimuth of l78°. What is the location of the patrol's position to the nearest 50m?

ANS.

4. You are a pilot who had to make an emergency landing behind enemy lines. All you know is that you landed on Highway l7 and that you can see the camp tower in GS 7733 on a magnetic azimuth of 130° 30'. What 8-digit grid coordinate

should you radio in for a CH-53 pick-up?

ANS.

Section 3

1. The armored column that was previously sighted has halted near Everett Creek. You decide to call for an air strike. The OP at Yopps Church (GS 7926) sights the column on a magnetic azimuth of 295°. Another OP, in the building at the road junction in GS 7626, can see the same armored column on a magnetic azimuth of 16°. What is the location of the armored column to the nearest 50m?

ANS.

2. The air strike you requested has been run. You and your patrol are helo-lifted to the area to assess the damage. After you have been dropped in the LZ, you are confused as to your position. You see the water tower in GS 7530 on a magnetic azimuth of 327°. You see the light tower in Stone Bay in GS 7830 on a magnetic azimuth of 55°. What is the 8-digit coordinate of your position to the nearest 50m?

ANS.

3. Your recon patrol was ambushed with 4 friendly WIA. You are now located on a hard surface road and you can see hill 16 in GS 8730 on a magnetic azimuth of 283°. What 8-digit grid coordinate would you radio in for a medevac pick-up?

ANS.

REQUIREMENT 2

MAP: Margarita Peak, California, 1:50,000, Sheet 2550 IV, Series V795, Edition 8-NIMA

1. From your position on hill 411 in GS 5790, you observe a tank column moving up Interstate 5. After shooting a magnetic azimuth to the tank column, you determine the corresponding grid azimuth to be 208°. What is the location of the tank column to the nearest 50m?

ANS.

2. You are leading a patrol south on an unimproved dirt road. Battalion requests the coordinates of your position. From where you are, you can see the water tank in GS 6189 at a distance of roughly 3000m. After shooting a magnetic azimuth to the water tank, you determine the corresponding grid azimuth to be 249°. What is the location of your position to the nearest 50m?

ANS.

3. From your OP on hill 176 in GS 6393, you observe enemy activity on the unimproved road in GS 6391. After shooting a magnetic azimuth to the enemy, you determine the corresponding grid azimuth to be 175°. What is the location of this activity to the nearest 50m?

ANS.

4. You are located somewhere along an unimproved road east of Margarita Peak (GS 6300). You can see the lookout tower in GS 6302 on a magnetic azimuth of 239° and at a distance of about 2700m. What is the location of your position to the nearest 50m?

ANS.

5. During the hours of darkness, your OP on top of hill 236 in GS 6593 observes lights on a magnetic azimuth of 132°. Another OP on hill 201 in GS 6992 also observes the lights on a magnetic azimuth of 216°. What is the location of the lights to the nearest 50m?

ANS.

6. From your vantage point at horizontal control point 172 in GS 5786 you see enemy troops digging in on a magnetic azimuth l46°. Moving to a new vantage point at grid coordinate 59908565 you see them on a magnetic azimuth of 226°. To the nearest 50m, what is the location of the enemy?

ANS.

7. You are somewhat east of San Onofre Canyon, California (GS 5495 - GS 6299). You decide to pinpoint your location by two point resection. Using your compass you shoot the following magnetic azimuths:

Margarita Peak	GS 6300	45°
hill 667	GS 5999	265°

What is the location of your position to the nearest 50m?

ANS.

8. You desire to accurately locate your position. You know that it is somewhere southeast of the target range. You take two compass readings as follows:

water tower	GS 7493	16°
hill 269	GS 7393	326°

a. What is the location of your position to the nearest 50m?

ANS.

b. What method of location is this?

ANS.

9. You are the forward observer for a company located at BM 236.2 in GS 7589. On a magnetic azimuth of 261°, you see a group of enemy soldiers loading munitions onto a train on a main line railroad track. What is the 8-digit grid coordinate, to the nearest 50m, which you will use in your call for fire?

ANS.

10. You are at an unknown location and see enemy troops loading supplies onto a truck. The magnetic azimuth from your position to the truck is 165°. You can also see the following points and have recorded magnetic azimuths to each:

road junction	(59659295)	256°
hilltop	(GS 6093)	4°

A recon patrol has spotted the same target. They report their location as grid coordinate 58489139. The target is on a magnetic azimuth of 75° from their position.

What are the coordinates, to the nearest 50m, of:

a. your position? ANS.

b. the enemy truck? ANS.

REQUIREMENT 3

Map: Quantico, Virginia, 1:50,000, Sheet 5561 III, Series V734, Edition 6-DMA

1. You are a motor transport officer setting up a perimeter defense around the temporary motor pool you've established. It's night and you are unable to walk the ground in front of your position to "set your machine guns in." You decide to construct a terrain profile to determine the deadspace along your final protective fire (FPF) lines for one of your guns. Your motor pool is set up around a hill in GS 9284. The 8-digit grid coordinate of your machine gun is 92708437. The FPF will be laid down a draw on a magnetic azimuth of 87°. Construct a terrain profile and extend it for 1100m.

2. You've put another gun in, shooting down a draw at grid coordinate 92608423 on a magnetic azimuth of 180°. Construct a terrain profile and extend it for 1100m.

REQUIREMENT 1 SOLUTION

Section 1	Section 2	Section 3	
1. 89932655	1. 88602600	1. 76452771	
2. 87972833	2. 77662705	2. 76802695	
3. 89682613		3. 77202477	3. 90733035
4. 73183767		4. 73053710	

REQUIREMENT 2 SOLUTION

1. 55638703
2. 64099024
3. 63709185
4. 65650272
5. 66749065
6. 58078455
7. 61299916
8. a. 73809261 ± 50m
   b. two point resection
9. 73246974
10. a. 60159295
    b. 60179141

REQUIREMENT 3 SOLUTION

1. You were given a magnetic azimuth of 87°.
   a. Convert to a grid azimuth.

   MA ± GM = GA
   E +
   W -

   87° - 7.5° = 79.5°

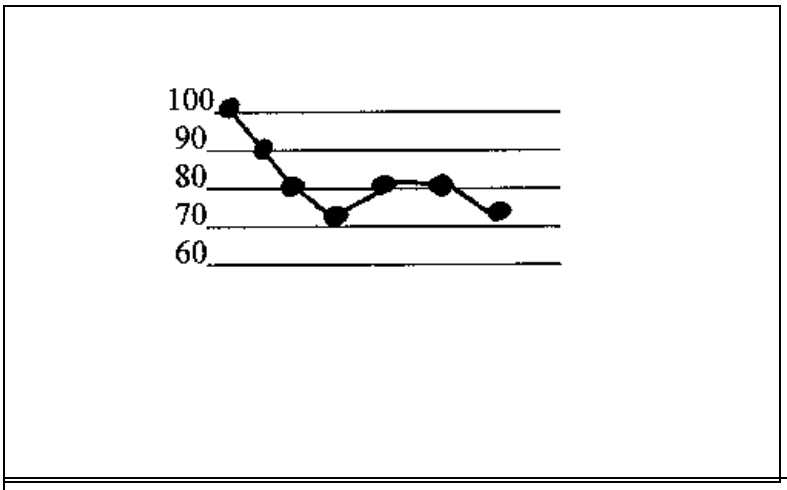
   b. Construct a chart.
   c. Plot the terrain profile.

2. You were given a magnetic azimuth of 180°.
   a. Convert to a grid azimuth.

   MA ± GM = GA
   E +
   W -

   180° - 7.5° = 172.5°

   b. Construct a chart.
   c. Plot the terrain profile.


100
90
80
70
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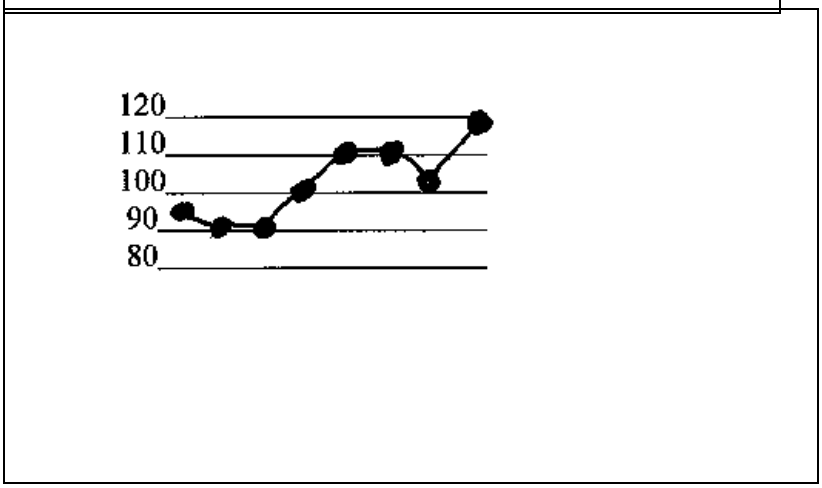
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